National Aeronautics and Space Administration

Office of Space Science

Education and Public Outreach

Annual Report
FY 2001

ON THE COVER: Among the highlights of the NASA Office of Space Science Education and Public Outreach Program in Fiscal Year 2001 were (clockwise from bottom) the opening of *Explore the Universe,* a new Smithsonian National Air and Space Museum gallery, featuring the backup mirror for the Hubble Space Telescope; the development of *Touch the Universe: A NASA Braille Book of Astronomy,* a new resource that uses tactile overlays to allow a visually impaired student to explore space science images; and the June 21, 2001, live broadcast/Webcast of a total solar eclipse from Africa during which space scientists, including members of the National Society of Black Physicists, served as hosts for groups gathered in local communities to view the event.

"The most important result of NASA's Space Science program is the sense of wonder and imagination it inspires in America's youth."

Edward J. Weiler,
NASA Associate Administrator for Space Science

FOREWORD

As we go to press with this Fiscal Year 2001 Annual Report on NASA Space Science Education and Public Outreach activities, we recognize that we are living in a changed world. The tragic events that brought the fiscal year to a close reminded us all that national security is an imperative we cannot afford to ignore.

These events brought sharply to mind the now-prophetic Phase III Report of the U.S. Commission on National Security in the 21st Century, *Roadmap for National Security: Imperative for Change,* that was published only seven months earlier. In this report, the Hart-Rudman commission singled out "the capacity of America's education system to create a 21st century workforce second to none in the world" as "a national security issue of the first order." The report then went on to say that "education in science, mathematics, and engineering has special relevance for the future of U.S. national security, for America's ability to lead depends particularly on the depth and breadth of its scientific and technical communities" and that "the health of the U.S. economy" depends "not only on professionals who can produce and direct innovation in a few key areas, but also on a populace that can effectively assimilate a wide range of new tools and new technologies."

We in the NASA Office of Space Science, take these words and our responsibilities to act upon them very seriously. The education and public outreach program that we embarked upon eight years ago directly addresses each of the above security imperatives through our primary goals of sharing the excitement of space science discoveries with the public; enhancing the quality of science, mathematics, and technology education, particularly at the precollege level; and helping to create our 21st century scientific and technical workforce.

As chronicled in this Annual Report, the NASA space science community interacted directly with over 20,000 students, 50,000 teachers, and 100,000 members of the general public during FY 2001. In so doing, they brought the excitement of our space science missions and discoveries to the students, used it to enhance the science curricula and knowledge of the teachers, and contributed to improving the scientific literacy of the public. In addition, we made this same information available to a potential audience of over 200 million more students, teachers, and members of the American public through Webcasts, exhibits, and media broadcasts. We believe that these efforts are helping to get thousands of students each year excited about pursuing careers in science and, in so doing, contributing to the long-term economic health and security of our country.

Edward J. Weiler
Associate Administrator for Space Science

PREFACE

The NASA Office of Space Science (OSS) Education and Public Outreach (E/PO) program is built on the premise that a relatively small number of people working conscientiously at developing multiple partnerships and highly leveraged projects can have a major impact on science and technology education throughout the Nation. Eight years ago, that was merely a premise. In the years since, that glimmer of an idea has been shaped into a formal strategy and implemented across all OSS missions and research programs. Now, that small number of people includes nearly 900 OSS-affiliated scientists, technologists, and support staff; the partners include nearly 500 institutions and organizations; and the leveraging has put an OSS E/PO presence in all 50 States, the District of Columbia, and the U.S. territories of Guam and Puerto Rico. The snapshot of this extremely broad range of E/PO activities and products captured in this Annual Report is impressive. In total, more than 400 separate and distinct activities and products involving nearly 3,000 individual events taking place in Federal Fiscal Year (FY) 2001 are summarized in this Annual Report.

The large number of products and activities, coupled with the fact that they are, by design, highly leveraged and broadly distributed, make collecting the data contained in this report a significant challenge. I am extremely grateful to the many people—too numerous to name—who put enormous efforts into designing the tracking and reporting system, collecting and entering into it mountains of data and information, and finally distilling that information into this Annual Report. I believe that the report gives a very comprehensive view of the breadth and scope of the OSS E/PO Program. But, as was the case last year, I still believe that the picture it gives is not complete. An unknown number of projects, partners, and participants were undoubtedly left out. To them, I apologize and say that we will make an even more concerted effort to include them in future years.

As you leaf through this Annual Report, I urge you to be aware of the many places we have reached and people we have touched. For example, activities took place not only in major science centers in America's largest cities, but also in hundreds of small planetariums and museums scattered across rural America. Partners included not only the major science and education organizations, but also professional societies of minority scientists. Participants included not only substantial numbers of students, teachers, and members of the general public that are traditionally served by such programs, but also audiences that are not traditionally served, such as students with disabilities, Native Americans, and inner city youths. For this reason, we not only believe that our efforts to use space science missions to enhance science and technology education and to excite students and young people about careers in science is working, but we also believe that it is beginning to involve individuals from groups who, at the current time, are not as effectively utilized as they should be in science and technology. Getting them involved and utilizing their talents is crucial to meeting the future needs of our society—a society that relies in a very fundamental way upon science and technology for economic growth and national security.

This is only the second Annual Report on the OSS E/PO Program, yet it is already more than twice the size of the first one. That growth is a testimony to the very hard work and extraordinary dedication of the study teams that developed the OSS E/PO Strategic and Implementation Plans, the space scientists who were involved in planning and carrying out the E/PO components of OSS missions and research programs, the OSS E/PO Support Network members who have given selflessly to assisting others in developing high-quality E/PO projects, the educators who have worked so enthusiastically with the space science community, and the NASA managers who continue to place a high priority on E/PO activities. It offers a challenge for continued growth, productivity, and even greater achievements by the OSS E/PO Program in future years.

Jeffrey D. Rosendhal
Education and Outreach Director
Office of Space Science

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This Annual Report is a summary of more than 400 Education and Public Outreach (E/PO) products and activities developed or carried out in FY 2001 under NASA's Office of Space Science (OSS) E/PO Program. It includes products and activities developed through the E/PO efforts of OSS missions and research programs, the *Initiative to Develop Education through Astronomy and Space Science (IDEAS) Program, the Minority University Education and Research Partnership Initiative in Space Science,* the OSS E/PO Forums and Broker/Facilitators, and a number of additional comprehensive or special-purpose E/PO projects managed by OSS at NASA Headquarters. Taking into account the fact that many of the reported activities involve multiple events that took place in a variety of venues, the total number of E/PO events reported for FY 2001 is nearly 3,000—with events having taken place in all 50 States, the District of Columbia, and Puerto Rico.

Prekindergarten students and their parents at the Raul Yzaguirre School for Success, a charter school in Houston, proudly display homemade spacesuits they wore for a Web quest to learn about black holes.

One measure of the success of the OSS E/PO Program is the more than 50 awards or other forms of public recognition for educational excellence that OSS E/PO efforts received in FY 2001. The vast majority of these awards were for Web sites providing information on NASA space science missions and educational resources based on that information. Recognition of the quality of these Web sites came from professional science societies such as the American Association for the Advancement of Science and the American Physical Society, from education organizations such as the U.S. Department of Education and the Los Angeles County Office of Education, and from various public media and Web resource organizations. Also significant were the International Technology Education Association's Presidential Citation, awarded to the New Millennium Program's *Space Place* for its role in technology education, and the growing number of major NASA awards recognizing significant contributions to space science education made by individuals or groups both inside and outside of NASA.

Science centers, museums, and planetariums provide particularly important venues for using the results of NASA space science missions to improve the public understanding of science and technology. In FY 2001, OSS provided materials, technical expertise, and other resources for use in exhibits, planetarium shows, displays, and education projects at more than 300 science centers, museums, and planetariums in 45 States, the District of Columbia, and the U.S. territories of Guam and Puerto Rico. One particularly innovative resource is *ViewSpace*, a multimedia astronomy display that gives museums and planetariums—particularly small ones—an opportunity to show continuously updated images from Hubble Space Telescope (HST) and other NASA space science projects in their galleries.

Explore the Universe, a new permanent exhibition at the Smithsonian National Air and Space Museum featuring the Hubble Space Telescope backup mirror and other NASA space astronomy hardware in its historical context, opened in September 2001. Several major traveling museum exhibitions, featuring OSS missions, continued their national tours. The *Space Weather Center* exhibition had stops at the Maryland Science Center, the NASA Goddard Space Flight Center visitor center, the Lawrence Hall of Science, and the Adler Planetarium and Science Museum. The *Hubble Space Telescope: New Views of the Universe* exhibition was on display during FY 2001 at Space Center Houston in Houston, TX, the Strategic Air and Space Museum in Ashland, NE, and the North Carolina Museum of Natural Sciences in Raleigh, NC. A smaller version of the Hubble exhibition visited the Castle Museum in Saginaw, MI, the Springfield Science Museum in Massachusetts, the Family Museum in Bettendorf, IA, and the Chabot Space and Science Center in Oakland, CA. The *MarsQuest* exhibition concluded its opening run at the McWane Science Center in Birmingham, AL, and embarked on a national tour with stops at the Orlando Science Center and the Tucson Children's Museum. In addition, the New Millennium Program's *Space Place* provided outreach activities to over 250 museums, planetariums, and libraries in rural areas of the country, drawing in audiences traditionally not reached by NASA.

Providing opportunities for meaningful participation in space science activities by individuals from groups that are currently underserved and underutilized in science and technology continued to be a critical concern for OSS. A major new OSS focus in FY 2001 was forming working relations with a network of professional societies of minority scientists. The officers of 11 such professional societies met with members of the OSS E/PO Support Network to explore potential collaborative projects. One of that effort's specific outcomes was that more than 20 members of the National Society of Black Physicists served as hosts and science experts at local sites in African American communities for viewing a live broadcast/Webcast of the June 21, 2001, total solar eclipse from Africa.

A family interacts with the plasmosphere of the *Space Weather* Center exhibit.

Southwestern Indian Polytechnic Institute established a new meteorite identification laboratory through a partnership with the University of New Mexico.

Fifteen minority universities, including six Historically Black Colleges and Universities (HBCU), three Hispanic Serving Institutions (HSI), and three Tribal Colleges (TCU), began work under the *Minority University Education and Research Partnership Initiative in Space Science*. During FY 2001, those institutions established a total of eight new space science faculty positions and redirected 10 previously existing faculty positions towards space science. They offered or were developing a total of 32 new and 13 revised undergraduate or graduate space science courses, and they established or were developing one new space science major and nine new space science minors. They initiated more than 30 working partnerships with major space science research groups, including involvement in seven space science missions or suborbital experiments.

OSS's work to reach underserved/underutilized groups was not restricted to minorities and minority universities. For example, in an effort to serve students with special needs, *Touch the Universe: A NASA Braille Book of Astronomy*, a resource that allows visually impaired readers to experience images from HST through tactile overlays, was developed; and *Exceptional Space Science Materials for Exceptional Students*, a workshop to train NASA educational specialists in how to develop space science education materials for students with disabilities, was held.

During FY 2001, efforts were begun to develop means by which educators using the NASA Space Science Education Resource Directory, an online repository of OSS educational resources located at *http://teachspacescience.org*, can order hardcopy materials—in addition to the electronic materials already offered—online from the Resource Directory. A partnership was made with the NASA Central Operation of Resources for Educators (CORE) to handle orders for OSS multimedia educational materials (e.g., videos, CDs, or slides), and steps were also taken to begin acquiring one or more commercial partners to provide similar services for printed materials. Appendix A of this Annual Report contains descriptions of the more than 90 new educational products that were registered in the Resource Directory in FY 2001, including the new *Real Reasons for Seasons* Great Explorations in Math and Science (GEMS) teacher's guide, created in collaboration with the Lawrence Hall of Science.

The report also summarizes more than 160 OSS-sponsored educational activities that directly supported classroom education, and over 90 educational activities directed at reaching the public. Through these two areas, OSS contributed both to motivating and training the future scientific workforce and to improving the general public's understanding of science and technology. Additional activities were aimed at encouraging members of the space science community to contribute to E/PO activities and at improving the effectiveness of their participation. Through these activities, OSS-affiliated scientists, technologists, and support personnel interacted directly with nearly 200,000 teachers, students, and members of the public. In addition, more than 50 million people participated in such activities over the Internet, and an estimated potential audience of more than 200 million people was reached through large public events, exhibits, periodicals, and media broadcasts.

Essential to carrying out this vast portfolio of E/PO activities was the direct participation of nearly 900 OSS-affiliated scientists, technologists, and support staff and the participation and contributions of nearly 500 institutional and organizational partners. In addition, OSS had a substantial presence at approximately 70 national or regional scientific and education conferences. Exhibits, workshops, materials, and knowledgeable staff were present at such conferences, which provided significant opportunities to discuss space science E/PO resources, opportunities, and issues with conference attendees.

Merely citing statistics would be inadequate, however, if OSS also were not making a concerted effort to assess the quality and effectiveness of its E/PO activities. Evaluation is a central element of the OSS E/PO Program. During FY 2001,

Hands-on activities take place during a NASA Jet Propulsion Laboratory outreach visit to a classroom in Colorado.

OSS received the second in a series of evaluation reports—dealing with the progress being made by OSS towards realizing its E/PO goals—from its external evaluator, the Program Evaluation and Research Group at Lesley University in Cambridge, MA. The third phase of the Lesley work, dealing with the effectiveness and impact of OSS's work in E/PO, was also initiated in FY 2001. Arrangements were completed as well for conducting a comprehensive review of the OSS E/PO Program through a task force of the NASA Space Science Advisory Committee.

At the close of FY 2001, a number of major activities were planned to be continued or completed over the next few years. *Voyage*, an accurate, one-ten-billionth scale model solar system, was scheduled to open on the National Mall in Washington, DC, on October 17, 2001. *Cosmic Questions: Our Place in Space and Time*, a 5,000-square-foot traveling exhibition about the universe and our place in the cosmos, was scheduled to open in the fall of 2002 at Boston's Museum of Science. Continuing an ongoing series of public television broadcasts, the second *Live from Mars* program was scheduled to be broadcast from the NASA Jet Propulsion Laboratory and the Mars Imaging Facility at Arizona State University on March 19, 2002. The next day, March 20, 2002, a national Sun-Earth Day celebration was planned. On this day, classrooms, museums, and planetariums across the country planned to use the vernal equinox as a vehicle for engaging in special educational activities on the Sun, geospace, and their effects on Earth.

With these and many other new projects planned for FY 2002 and beyond, the OSS E/PO Program looks forward to continued growth, continuous improvements in effectiveness and educational impact, and increasing efforts to reach nontraditional audiences. Within the education and the space science communities, awareness and recognition of the scope of the OSS E/PO Program continues to grow, and that awareness has triggered increasing interest by both space scientists and educators in participating in the program.